

## SYSTEMS INTEGRATION WILL BE KEY TO MEETING GOALS

### Description

National Fuel Cell Research Center (NFCRC) of the University of California and its partners will define engineering issues associated with integrating fuel processing, power generation, and emissions control subsystems and components into overall power systems that meet Vision 21 goals. Unlike today's energy plants, which often are based on a single technology, Vision 21 energy plants will need to use combinations of advanced technologies in order to meet Vision 21 efficiency goals. Advanced power generation technologies now being developed, such as the solid oxide fuel cell and advanced turbines, cannot reach Vision 21 goals by themselves. Rather, these technologies will need to be combined into complex configurations that utilize as much of the feedstock energy as practicable. Major advances in systems integration "know-how" are necessary if reliable, cost-effective, Vision 21 plants are to be built.

In carrying out its work, the NFCRC team will use unique computational modeling and simulation tools, including a simulator called APOGEE (for Advanced Power Generation Evaluation) developed at the NFCRC. Existing commercially available models for energy plants, including models for simulating power plants and chemical plants, do not have the capabilities and flexibility needed to study advanced Vision 21 energy plants. For example, power plant models can handle gas and steam turbines but not fuel cells. Chemical plant models can predict thermodynamic properties of non-ideal systems but cannot handle power generation equipment, especially fuel cells, with sufficient detail. APOGEE was developed to handle complex configurations of advanced energy systems, especially those combining electrochemical and thermodynamic cycles.

### PRIMARY PARTNER

**National Fuel Cell Research  
Center of the University of  
California**  
Irvine, CA

### TOTAL ESTIMATED COST

\$1,985,927

### COST SHARING

DOE	\$1,500,000
Non-DOE	\$485,927

### WEB SITE

[www.netl.doe.gov](http://www.netl.doe.gov)

### Benefits

The NFCRC project will provide the emerging post-regulation, market-based power industry with the insight needed to apply advanced technologies to generate greener, low-cost power to their customers.



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## Goals

The NFCRC team will conduct a three-part study that promises to change the way by which the next generation of energy plants utilizes fossil fuels.

The study will:

1. Identify those combinations of fossil fuels and “opportunity” feedstocks (e.g., biomass, petroleum coke, municipal and industrial wastes), fuel handling/processing systems, power generation modules, and emission control modules that meet Vision 21 goals.
2. Determine the key technical, operability, and economic factors of the resulting plants that would affect the integration of subsystems and components.
3. Define R&D needs that address the issues that must be resolved to assure successful systems integration into viable Vision 21 plants. The many possible plant configurations and thermodynamic cycles will be evaluated in a systematic and consistent manner to ensure that all technologies are considered on a “level field” and that those combinations that meet the stringent Vision 21 requirements are accurately identified.

## CONTACT POINTS

### Rodney Geisbrecht

National Energy Technology  
Laboratory  
P.O. Box 10940  
626 Cochran's Mill Road  
Pittsburgh, PA 15236-0940  
(412) 386-4870  
rodney.geisbrecht@netl.doe.gov

### Scott Samuelson

National Fuel Research Center  
(949) 824-1558  
gss@uci.edu

## PROJECT PARTNERS

**KraftWork Systems,  
Incorporated**  
Amston, CT

**Spencer Management  
Associates**  
Diablo, CA

**Pratt & Whitney Aircraft**  
East Hartford, CT

